



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE
NASIONALE
SENIOR SERTIFIKAAT**

GRADE/GRAAD 11

MATHEMATICS P2/WISKUNDE V2

NOVEMBER 2016

MEMORANDUM

MARKS/PUNTE: 150

**This memorandum consists of 21 pages.
*Hierdie memorandum bestaan uit 21 bladsye.***

DEPARTMENT OF BASIC EDUCATION
PRIVATE BAG X996, PRETORIA 0001
2016 -11- 11
APPROVED MARKING GUIDELINE PUBLIC EXAMINATION

WkWhite
15/11/2016

NOTE:

- If a candidate answered a question TWICE, mark only the FIRST attempt.
- If a candidate crossed out an answer and did not redo it, mark the crossed-out answer.
- Consistent accuracy applies to ALL aspects of the marking memorandum.
- Assuming values/answers in order to solve a problem is unacceptable.

LET WEL:

- As 'n kandidaat 'n vraag TWEE keer beantwoord het, sien slegs die EERSTE poging na.
- As 'n kandidaat 'n antwoord deurgehaal en nie oorgedoen het nie, sien die deurgehaalde antwoord na.
- Volgehoue akkuraatheid is op ALLE aspekte van die memorandum van toepassing.
- Dit is onaanvaarbaar om waardes/antwoorde te veronderstel om 'n probleem op te los.

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QUESTION/VRAAG 1

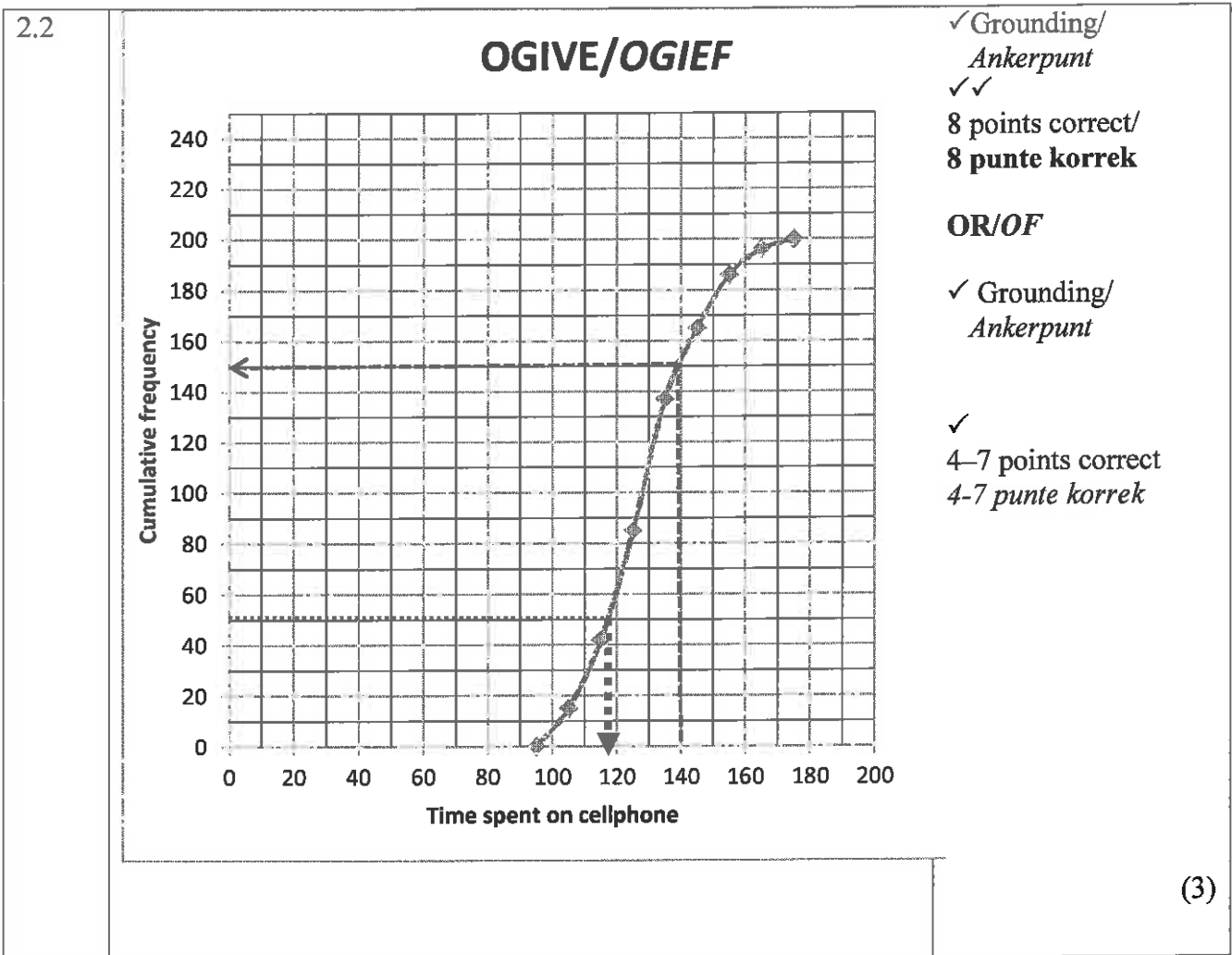
5	8	15	20	25	27	31	36	75
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1.1	$\text{Range/Omvang} = 75 - 5$ $= 70$	✓ answer/antw (1)
1.2	$\text{Std dev/Std afwyking} = 19,56$	✓ rounding/afroning ✓ answer/antw (2)
1.3	$\text{Median/Mediaan} = 25$	✓ answer/antw (1)
1.4	$Q_1 = \frac{8+15}{2} = 11,5$ $Q_2 = \frac{31+36}{2} = 33,5$ $\text{IQR} = Q_3 - Q_1$ $= 33,5 - 11,5$ $= 22$	✓ $Q_1 = 11,5$ ✓ $Q_3 = 33,5$ ✓ CA answer/antw (3)
1.5		✓ Q_1 and Q_3 ✓ Q_2 ✓ min and max min en maks (3)
1.6	Skewed to the right/skeef na regs Positively skewed/positief skeef	✓ answer/antw (1)
1.7	Outlier/uitskieter = 75 OR/OF $33.5 + 1.5(22) = 66.5$ Outlier/uitskieter = 75	✓ answer/antw ✓ answer/antw (1) [12]

QUESTION/VRAAG 2

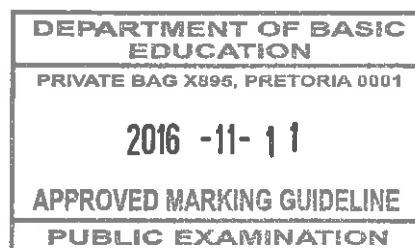
2.1	<table border="1"> <thead> <tr> <th>TIME SPENT/ TYD SPANDEER (IN MINUTES/ MINUTE)</th> <th>FREQUENCY FREKWENSIE f</th> <th>CUMULATIVE FREQUENCY/ KUMULATIEWE FREKWENSIE cf / kf</th> </tr> </thead> <tbody> <tr> <td>$95 < x \leq 105$</td> <td>15</td> <td>15</td> </tr> <tr> <td>$105 < x \leq 115$</td> <td>27</td> <td>42</td> </tr> <tr> <td>$115 < x \leq 125$</td> <td>43</td> <td>85</td> </tr> <tr> <td>$125 < x \leq 135$</td> <td>52</td> <td>137</td> </tr> <tr> <td>$135 < x \leq 145$</td> <td>28</td> <td>165</td> </tr> <tr> <td>$145 < x \leq 155$</td> <td>21</td> <td>186</td> </tr> <tr> <td>$155 < x \leq 165$</td> <td>10</td> <td>196</td> </tr> <tr> <td>$165 < x \leq 175$</td> <td>4</td> <td>200</td> </tr> </tbody> </table>	TIME SPENT/ TYD SPANDEER (IN MINUTES/ MINUTE)	FREQUENCY FREKWENSIE f	CUMULATIVE FREQUENCY/ KUMULATIEWE FREKWENSIE cf / kf	$95 < x \leq 105$	15	15	$105 < x \leq 115$	27	42	$115 < x \leq 125$	43	85	$125 < x \leq 135$	52	137	$135 < x \leq 145$	28	165	$145 < x \leq 155$	21	186	$155 < x \leq 165$	10	196	$165 < x \leq 175$	4	200	<p>✓ first 4 correct / eerste 4 korrek CF values /KF waardes</p> <p>✓ last 4 correct CF values/ laaste 4 korrekte KF waardes</p>
	TIME SPENT/ TYD SPANDEER (IN MINUTES/ MINUTE)	FREQUENCY FREKWENSIE f	CUMULATIVE FREQUENCY/ KUMULATIEWE FREKWENSIE cf / kf																										
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	$145 < x \leq 155$	21	186																										
	$155 < x \leq 165$	10	196																										
$165 < x \leq 175$	4	200																											

(2)



(3)

2.3	$Q_1 = 118$ Accept any answer between (115 and 120)	✓ CA ✓ CA answer/antw (2)
2.4	$Number\ of\ learners / Getal\ leerdere = 200 - 150$ $= 50$ Accept 150 or any other reading between (145 and 155)	✓ CA 150 ✓ CA 50 (2) [9]



Wkw

QUESTION/VRAAG 3

<p>3.1</p>	$M = \left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2} \right)$ $= \left(\frac{6+2}{2}; \frac{-2+15}{2} \right)$ $= \left(4; \frac{13}{2} \right)$	<p>✓ x-coordinate x-koordinaat ✓ y- coordinate y-koordinaat (2)</p>
<p>3.2</p>	$m_{BC} = \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{15 - 3}{2 - (-4)}$ $= 2$ $m_{MN} = m_{BC} = 2 \quad [BC \parallel MN]$ <p>OR/OF</p> $N \left(1; \frac{1}{2} \right)$ $m_{MN} = \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{13 - 1}{4 - 1}$ $= 2$	<p>✓ subst into gradient form./subst in gradiëntform ✓ answer/antw ✓ gradients equal/ gradiënte gelyk ✓ N(1; 1/2) ✓ subst into gradient form./subst in gradient form ✓ answer/antwoord (3)</p>
<p>3.3</p>	$y - y_1 = m(x - x_1)$ $y - \frac{13}{2} = 2(x - 4)$ $y = 2x - \frac{3}{2} \quad \text{OR/OF}$ $y = mx + c$ $\frac{13}{2} = 2(4) + c$ $-\frac{3}{2} = c$ $y = 2x - \frac{3}{2}$	<p>✓ subst (4; 13/2) and m = 2 into str line eq. / subst (4; 13/2) en m = 2 in reguitlyn verg. ✓ answer/antw (2)</p>

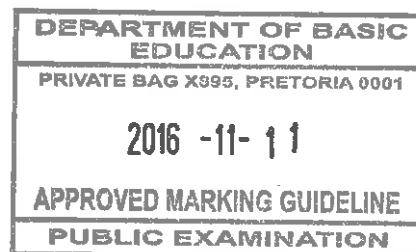
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<p>3.4</p>	<p>N is a midpoint of AC / <i>N is die middelpunt van AC</i> [Line through midpoint of one side parallel to second side / <i>omgekeerde van mdpt stelling.</i>]</p> $N\left(\frac{-4+6}{2}; \frac{3+(-2)}{2}\right)$ $= N\left(1; \frac{1}{2}\right)$ <p>OR/OF</p> $m_{AC} = \frac{3 - (-2)}{(-4) - 6}$ $= -\frac{1}{2}$ <p>Equation of AC $y - y_1 = m(x - x_1)$</p> $y - 3 = -\frac{1}{2}(x - (-4))$ $y = -\frac{1}{2}x + 1$ $-\frac{1}{2}x + 1 = 2x - \frac{3}{2}$ $-x + 2 = 4x - 3$ $x = 1$ $y = 2(1) - \frac{3}{2}$ $= \frac{1}{2}$ <p>$N\left(1; \frac{1}{2}\right)$</p>	<p>✓ S ✓ R ✓ x-value/waarde ✓ y-value/waarde</p> <p>✓ gradient of AC</p> <p>✓ equation of AC/ <i>Vergelyking van AC</i></p> <p>✓ equating/gelykstelling</p> <p>✓ $N\left(1; \frac{1}{2}\right)$</p> <p>(4)</p>
<p>3.5</p>	<p>N is the midpoint of BD and the midpoint of AC [diagonals of parm bisect] <i>N is die midpt v BD en midpt v AC [hoeklyne van parm halveer]</i></p> $\left(\frac{2+x}{2}; \frac{y+15}{2}\right) = \left(1; \frac{1}{2}\right)$ $\frac{2+x}{2} = 1 \qquad \frac{y+15}{2} = \frac{1}{2}$ $x = 0 \qquad y = -14$ <p>$D(0; -14)$</p>	<p>✓ CA $\frac{2+x}{2} = 1$</p> <p>✓ CA $\frac{y+15}{2} = \frac{1}{2}$</p> <p>✓ CA $x = 0$ ✓ CA $y = -14$</p> <p>Answer only: Full marks / Slegs antwoord: Vol punte</p>

	<p>OR/OF</p> <p>From B to A</p> <p>$(x; y) \rightarrow (x+4; y-17)$</p> <p>$D(-4+4; 3-17)$</p> <p>$D(0; -14)$</p>	<p>✓ $x+4$</p> <p>✓ $y-17$</p> <p>✓ subst</p> <p>✓ $D(0; -14)$</p> <p>(4)</p> <p>[15]</p>
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WKN

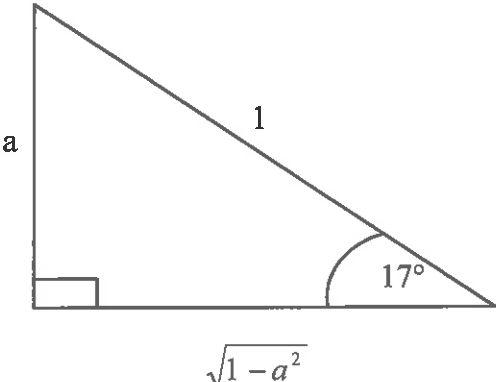
QUESTION/VRAAG 4

4.1	$m_{MP} = m_{PN}$ $\frac{2-0}{0-k} = \frac{4-2}{3-0}$ $\frac{2}{-k} = \frac{2}{3}$ $k = -3$	<p>✓ $m_{MP} = m_{PN}$ ✓ subst. in gradient form./vorm ✓ answer/antw</p> <p>(3)</p>
4.2	$\tan \alpha = m_{PN}$ $\tan \alpha = \frac{2}{3}$ $\alpha = 33,69^\circ$ $\tan \beta = m_{AB}$ $\tan \beta = -\frac{1}{2}$ $\beta = -26,57^\circ + 180^\circ$ $= 153,43^\circ$ <p>OR/OF $\tan \beta = m_{AB}$</p> $\tan \beta = -\frac{1}{2}$ $KA = \tan^{-1}\left(\frac{1}{2}\right)$ $= 26,57^\circ$ $\beta = 180^\circ - 26,57^\circ$ $= 153,43^\circ$ $\theta = 153,43^\circ - 33,69^\circ$ $= 119,74^\circ$	<p>✓ $\alpha = 33,69^\circ$ ✓ $\tan \beta = -\frac{1}{2}$ ✓ $153,43^\circ$ ✓ CA $119,74^\circ$</p> <p>(4)</p>
4.3	$-\frac{1}{2}x + 4 = 0$ $x = 8$ $R(8;0)$ $MR = 8 - (-3) \text{ OR/OF } MR = \sqrt{(-3-8)^2 - 0^2}$ $= 11 \text{ units / eenhede}$	<p>✓ $y = 0$ ✓ $x = 8$ ✓ CA answer/antw</p> <p>(3)</p>
4.4	$\text{Area of } \triangle MNR = \frac{1}{2} (MR) \cdot \perp \text{ height}$ $= \frac{1}{2} (11)(y - \text{value of } N)$ $= \frac{1}{2} (11)(4)$ $= 22 \text{ sq units/vk eenh}$	<p>✓ area formula/formule ✓ subst y-value of N subst y- waarde van N ✓ CA answer/antw</p>

WJW

	<p>OR/OF</p> $MN = \sqrt{(3 - (-3))^2 + (4 - 0)^2}$ $= \sqrt{36 + 16}$ $= \sqrt{52} \text{ units/eenh}$ <p>Area of/Opp van $\Delta MNR = \frac{1}{2} \times \sqrt{52} \times 11 \times \sin 33,69^\circ$</p> $= 21,999$ $\approx 22 \text{ sq units/vk eenh}$	<p>✓ CA $\sqrt{52}$</p> <p>✓ subst in area form <i>Subst in oppervlak formule</i></p> <p>✓ CA answer/antw</p> <p style="text-align: right;">(3) [13]</p>
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QUESTION/VRAAG 5

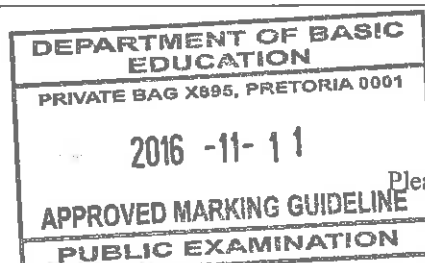
5.1.1	$x^2 + y^2 = r^2$ $(-8)^2 + (t)^2 = 17^2$ $t^2 = 225$ $t = -15$	<p>✓ subst in pyth</p> <p>✓ answer/antw</p> <p style="text-align: right;">(2)</p>
5.1.2(a)	$\cos(-\theta)$ $= \cos \theta$ $= \frac{-8}{17}$	<p>✓ $\cos \theta$</p> <p>✓ answer/antw</p> <p style="text-align: right;">(2)</p>
5.1.2(b)	$1 - \sin \theta = 1 - \frac{-15}{17}$ $= \frac{17}{17} + \frac{15}{17}$ $= \frac{32}{17}$	<p>✓ CA subst</p> <p>✓ CA answer/antw</p> <p style="text-align: right;">(2)</p>
5.2.1	$\tan 17^\circ = \frac{a}{\sqrt{1 - a^2}}$ 	<p>✓ Sketch/Pythagoras Skets/Pythagoras</p> <p>✓ $\sqrt{1 - a^2}$</p> <p>✓ CA answer/antw</p> <p>Answer only : Full marks/ Slegs antwoord: Vol punte</p>

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		(3)
5.2.2	$\sin 107^\circ$ $= \sin(90^\circ + 17^\circ)$ $= \cos 17^\circ$ $= \sqrt{1 - a^2}$ <p>OR/OF</p> $\sin 107^\circ$ $= \sin(180^\circ - 73^\circ)$ $= \sin 73^\circ$ $= \sqrt{1 - a^2}$	$\checkmark \cos 17^\circ$ $\checkmark \text{CA } \sqrt{1 - a^2}$ $\checkmark \sin 73^\circ$ $\checkmark \text{CA } \sqrt{1 - a^2}$
		(2)

5.2.3	$\cos^2 253^\circ + \sin^2 557^\circ$ $= (-\cos 73^\circ)^2 + (-\sin 17^\circ)^2$ $= (-a)^2 + (-a)^2$ $= 2a^2$	$\checkmark \cos^2 73^\circ$ $\checkmark \sin^2 17^\circ$ $\checkmark \text{subst of ratios/}$ subst van trig verhoudings $\checkmark \text{answer/antw}$
5.3	$\frac{\cos(180^\circ + 45^\circ)\sin(180^\circ - 45^\circ) + \sin(360^\circ - 30^\circ)}{\tan(180^\circ + 45^\circ)}$ $= \frac{(-\cos 45^\circ) \cdot (\sin 45^\circ) - \sin 30^\circ}{\tan 45^\circ}$ $= \frac{\left(-\frac{\sqrt{2}}{2}\right)\left(\frac{\sqrt{2}}{2}\right) - \frac{1}{2}}{1}$ $= -1$	$\checkmark -\cos 45^\circ$ $\checkmark \sin 45^\circ$ $\checkmark -\sin 30^\circ$ $\checkmark \tan 45^\circ$ $\checkmark \text{Special angle ratios}$ Speciale hoeke $\checkmark \text{CA answer/antw}$
		(6)



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5.4

$$\begin{aligned}
 RHS &= \frac{-1}{\tan^2 x \cdot \cos^2 x} \\
 &= \frac{-1}{\frac{\sin^2 x}{\cos^2 x} \times \cos^2 x} \\
 &= \frac{-1}{\sin^2 x} \\
 &= \frac{-1}{1 - \cos^2 x} \\
 &= \frac{1}{\cos^2 x - 1} \\
 &= \frac{1}{(\cos x + 1)(\cos x - 1)} \\
 &= LHS
 \end{aligned}$$

OR/OF

$$\begin{aligned}
 LHS &= \frac{1}{(\cos x + 1)(\cos x - 1)} \\
 &= \frac{1}{\cos^2 x - 1} \\
 &= \frac{1}{-\sin^2 x} \\
 &= \frac{-1}{\sin^2 x} \\
 &= \frac{-1}{\frac{\sin^2 x}{\cos^2 x} \times \frac{\cos^2 x}{1}} \\
 &= \frac{-1}{\tan^2 x \cdot \cos^2 x}
 \end{aligned}$$

✓ $\tan x = \frac{\sin x}{\cos x}$

✓ simplification/vereenv.

✓ identity/ identiteit

✓ factors /faktore

✓ $\cos^2 x - 1$

✓ $-\sin^2 x$

✓ $\frac{-1}{\sin^2 x}$

✓ $\frac{\sin^2 x}{\cos^2 x} \times \frac{\cos^2 x}{1}$

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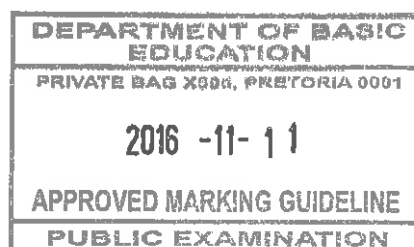
WVW

	<p>OR/OF</p> $RHS = \frac{-\cos^2 x}{\sin^2 x \cdot \cos^2 x}$ $= \frac{-1}{\sin^2 x}$ $LHS = \frac{1}{\cos^2 x - 1}$ $= \frac{1}{-\sin^2 x}$ <p>$RHS = LHS$</p>	$\checkmark \frac{1}{\tan^2 x} = \frac{\cos^2 x}{\sin^2 x}$ $\checkmark \frac{-1}{\sin^2 x}$ $\checkmark \cos^2 x - 1$ $\checkmark -\sin^2 x$ <p style="text-align: right;">(4)</p>
<p>5.5</p>	$2 \sin x \cos x - \cos x = 0$ $\cos x(2 \sin x - 1) = 0$ $\cos x = 0 \qquad \text{or} \qquad \sin x = \frac{1}{2}$ $x = 90^\circ + 360^\circ \cdot k, k \in Z \qquad x = 30^\circ + 360^\circ k, k \in Z \qquad \text{or}$ $x = 270^\circ + 360^\circ \cdot k, k \in Z \qquad x = 150^\circ + 360^\circ k, k \in Z$ <p>or</p> $x = 90^\circ + 180^\circ k, k \in Z$ <p>or</p> $x = \pm 90^\circ + 360^\circ k, k \in Z$ <div style="text-align: center; border: 1px solid black; padding: 5px; margin-top: 20px;"> <p>DEPARTMENT OF BASIC EDUCATION</p> <p>PRIVATE BAG X895, PRETORIA 0001</p> <p>2016 -11- 11</p> <p>APPROVED MARKING GUIDELINE</p> <p>PUBLIC EXAMINATION</p> </div>	$\checkmark \text{ factors / faktore}$ $\checkmark \text{ both equations/ beide verg.}$ $\checkmark \text{ BOTH general solutions for } \cos x = 0/ \text{ Altwee algemene oplossings vir } \cos x = 0$ $\checkmark \checkmark \text{ general solutions for } \sin x = \frac{1}{2} \text{ algemene oplossings vir } \sin x = \frac{1}{2}$ $\checkmark k \in Z$ <p style="text-align: right;">(6) [31]</p>

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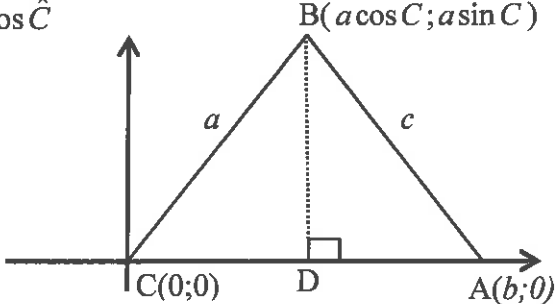
QUESTION/VRAAG 6

6.1	$b = 30^\circ$	✓ answer/antw (1)
6.2	360°	✓ answer/antw (1)
6.3	$f(x) = g(x)$ $x = -150^\circ$ $x = 30^\circ$	✓ $x = -150^\circ$ ✓ $x = 30^\circ$ (2)
6.4	$\sin(90^\circ - x) > g(x)$ $\cos x > g(x)$ $f(x) > g(x)$ $x \in (-150^\circ; 30^\circ)$ or $-150^\circ < x < 30^\circ$	✓ $\cos x$ ✓ end points/eindpnte ✓ notation/notasie (3)
6.5	Range: $y \in [2; 4]$ or / of $2 \leq y \leq 4$	✓ end points/eindpnte ✓ notation/notasie (2)
		[9]




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QUESTION/VRAAG 7

<p>7.1</p>	<p>$AB^2 = AD^2 + BD^2$ [pythagoras]</p> <p>$c^2 = (b - a \cos \hat{C})^2 + (a \sin \hat{C})^2$</p> <p>$= b^2 - 2ab \cos \hat{C} + a^2 \cos^2 \hat{C} + a^2 \sin^2 \hat{C}$</p> <p>$= b^2 - 2ab \cos \hat{C} + a^2 (\cos^2 \hat{C} + \sin^2 \hat{C})$</p> <p>$= a^2 + b^2 - 2ab \cos \hat{C}$</p> 	<ul style="list-style-type: none"> ✓ $B(a \cos C; a \sin C)$ ✓ $A(b; 0)$ ✓ distance formula/afstand formule. ✓ expansion/ontwikk. ✓ common factor/gemene faktor ✓ square identity/vierkants identiteit <p>(6)</p>
<p>7.1.2</p>	<p>$c^2 = a^2 + b^2 - 2ab \cos \hat{C}$</p> <p>$\therefore \cos \hat{C} = \frac{a^2 + b^2 - c^2}{2ab}$</p> <p>$1 + \cos \hat{C} = 1 + \frac{a^2 + b^2 - c^2}{2ab}$</p> <p>$= \frac{2ab}{2ab} + \frac{a^2 + b^2 - c^2}{2ab}$</p> <p>$= \frac{a^2 + 2ab + b^2 - c^2}{2ab}$</p> <p>$= \frac{(a+b)^2 - c^2}{2ab}$</p> <p>$= \frac{(a+b+c)(a+b-c)}{2ab}$</p>	<p>$c^2 = a^2 + b^2 - 2ab \cos \hat{C}$</p> <p>$\therefore \cos \hat{C} = \frac{a^2 + b^2 - c^2}{2ab}$</p> <ul style="list-style-type: none"> ✓ making cos C the subject of formula/maak cos C die onderwerp van die formule ✓ Adding 1 on both sides/ Tel 1 by albei kante ✓ simplifying/vereenvoudig ✓ factorising/faktorisering

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OR / OF

$$c^2 = a^2 + b^2 - 2ab \cos \hat{C}$$

$$\therefore \cos \hat{C} = \frac{a^2 + b^2 - c^2}{2ab}$$

$$RHS = \frac{(a+b)^2 - c^2}{2ab}$$

$$= \frac{a^2 + 2ab + b^2 - c^2}{2ab}$$

$$= \frac{a^2 + b^2 - c^2}{2ab} + \frac{2ab}{2ab}$$

$$= \cos \hat{C} + 1$$

= LHS

OR / OF

$$c^2 = a^2 + b^2 - 2ab \cos C$$

$$2ab \cos C = a^2 + b^2 - c^2$$

$$2ab + 2ab \cos C = a^2 + 2ab + b^2 - c^2$$

$$2ab(1 + \cos C) = (a+b)^2 - c^2$$

$$1 + \cos C = \frac{(a+b)^2 - c^2}{2ab}$$

$$c^2 = a^2 + b^2 - 2ab \cos \hat{C}$$

$$\therefore \cos \hat{C} = \frac{a^2 + b^2 - c^2}{2ab}$$

✓ Making cos C the subject of the formula/
Maak cos C die onderwerp van die formule

✓ writing as a difference of 2 squares/
Skryf as die verskil tussen twee vierkante

✓ expansion/ontwikkel

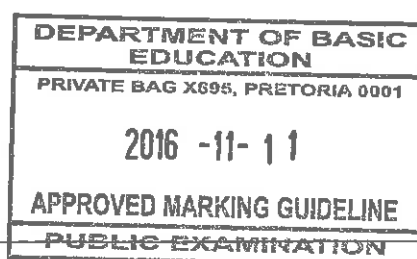
✓ splitting up the fraction / Deel die breuk in twee

✓ making $2ab \cos C$ the subject of the formula/
Maak $2ab \cos C$ die onderwerp van die formule

✓ adding 2ab on both sides of equation/
tel 2ab aan beide kante van die vergelyking

✓ common factor/
gemene faktor

✓ factorise the trinomial/
faktoriseer die drieterm



(4)

7.2.1	<p>In $\triangle ABD$</p> $\frac{BD}{\sin 109,16^\circ} = \frac{90,52}{\sin 31,23^\circ}$ $BD = \frac{90,52 \times \sin 109,16^\circ}{\sin 31,23^\circ}$ $= 164,92 \text{ m}$	<p>✓ sine rule/sinusreël</p> <p>✓ subst</p> <p>✓ answer/antw.</p> <p>(3)</p>
7.2.2	$CD^2 = 164,92^2 + 235^2 - 2 \times 164,92 \times 235 \times \cos 48,88^\circ$ $CD^2 = 31448,4874$ $CD = 177,34 \text{ m}$	<p>✓ cos rule/cosinusreël</p> <p>✓ subst</p> <p>✓ CA answer/antw.</p> <p>(3)</p>
		[16]

QUESTION/VRAAG 8

8.1	$\tan 35,5^\circ = \frac{0,5}{AB}$ $AB = \frac{0,5}{\tan 35,5^\circ}$ $= 0,7 \text{ m}$	<p>✓ subst</p> <p>✓ answer/antw</p> <p>(2)</p>
8.2	<p>Volume of cone $= \frac{1}{3} \times \pi (0,5)^2 \times 0,7$</p> $= 0,18 \text{ m}^3$ <p>Volume of a cylinder $= \pi (0,5)^2 \times 1,1$</p> $= 0,86 \text{ m}^3$ <p>$\frac{3}{4}$ of volume $= \frac{3}{4} \times (0,18 + 0,86)$</p> $= \frac{3}{4} \times (1,04) \text{ m}^3$ $= 0,78 \text{ m}^3$ <p>Time taken by pump $= \frac{0,78 \text{ m}^3}{0,52 \text{ m}^3/\text{h}}$</p> $= 1,5 \text{ hours}$	<p>✓ CA V of cone/keël</p> <p>✓ CA V of cylinder/silinder</p> <p>✓ CA 0,78 m³</p> <p>✓ CA answer/antw</p> <p>(4)</p>
		[6]

QUESTION/VRAAG 9

9.1	Equal to twice the angle subtended by the arc at the circumference	✓ ✓ answer/antw (2)
9.2.1	$\hat{R} = 30$ [\angle at centre = $2 \times \angle$ at circumference]	✓ S ✓ R (2)
9.2.2	$\hat{NST} = 30^\circ$ [equal chords subtends equal angles]	✓ S ✓ R (2) [6]

QUESTION/VRAAG 10

10.1	$D\hat{E}G = x + 20^\circ$ [alt \angle 's, ED FG] OR/OF $D\hat{E}G = 170^\circ - 2x$ [opp angles of cyclic quad]	✓ S ✓ R ✓ S ✓ R (2)
10.2	$x + 20^\circ + 2x + 10^\circ = 180^\circ$ [opp \angle of cyclic quad] $3x = 150^\circ$ $x = 50^\circ$ $D\hat{H}G = 2(50^\circ) + 10^\circ$ $= 110^\circ$ OR/OF $x + 20^\circ = 170^\circ - 2x$ [alt 's, ED FG] $3x = 150^\circ$ $x = 50$ $D\hat{H}G = 2(50^\circ) + 10^\circ$ $= 110^\circ$	✓ S ✓ R ✓ answer/antw ✓ 110° ✓ S ✓ R ✓ answer/antw ✓ 110° (4) [6]

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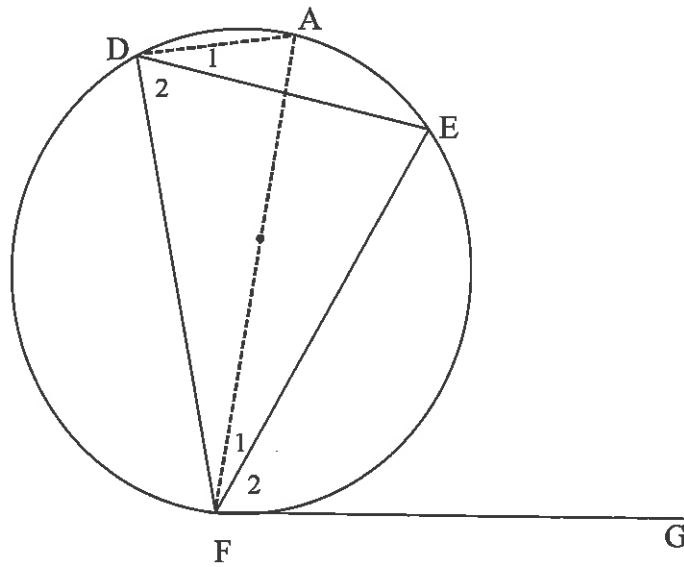
QUESTION/VRAAG 11

<p>11.1</p>	<p>SP = SR [tangents from the same point] $\hat{P}RS = 42,83^\circ$ [$\hat{<}$'s between equal sides] $\hat{O}RS = 90^\circ$ [tan \perp rad] $\hat{O}RN = 90^\circ - 42,83^\circ$ $= 47,17^\circ$ $\hat{N}OR = 90^\circ - 47,17^\circ$ [sum $\hat{<}$'s of Δ] $= 42,83^\circ$</p>	<p>✓ S ✓ S ✓ S/R ✓ $\hat{O}RN$ ✓ answer/antw</p> <p>(5)</p>
<p>11.2</p>	<p>Let $OR = x$ $OS = x + 9$ $\hat{O}RS = 90^\circ$ [tan \perp rad] $x^2 + 15^2 = (x + 9)^2$ [Pythagoras] $x^2 + 225 = x^2 + 18x + 81$ $18x = 144$ $x = 8 \text{ units}$ <i>radius = 8 units</i></p> <p style="text-align: center;">OR/OF</p> <p><i>In ΔNRS</i> $\cos 42,83^\circ = \frac{NR}{15}$ $NR = 15 \cos 42,83^\circ$ $= 11$</p> <p><i>In ΔORN</i> $\sin 42,83^\circ = \frac{11}{OR}$ $OR = \frac{11}{\sin 42,83} = 16,18$</p>	<p>✓ S ✓ S ✓ Using Pythagoras / <i>Gebruik Pythagoras</i> ✓ answer/antw</p> <p>✓ $\cos 42,83^\circ = \frac{NR}{15}$ ✓ 11 ✓ $\sin 42,83^\circ = \frac{11}{OR}$ ✓ 16,18</p> <p>(4)</p>
		<p>[9]</p>

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QUESTION/VRAAG 12



<p>12.1</p>	<p>Construction: Draw diameter AOF. Join A to D.</p> $\hat{F}_1 + \hat{F}_2 = 90^\circ \text{ [tan } \perp \text{ diameter]}$ $\hat{D}_1 = \hat{F}_1 \text{ [}\angle\text{'s in the same segment]}$ $\hat{D}_1 + \hat{D}_2 = 90^\circ \text{ [}\angle\text{ in a semi circle]}$ $\therefore \hat{F}_2 = \hat{D}_2$ $E\hat{F}G = F\hat{D}E$ <p style="text-align: center;">OR / OF</p> <p>Construction : Draw diameter AOF. Join A to E.</p> $\hat{F}_1 + \hat{F}_2 = 90^\circ \text{ [tan } \perp \text{ diameter]}$ $A\hat{E}F = 90^\circ \text{ [}\angle\text{'s in the semi circle]}$ $\hat{C} + \hat{F}_1 = 90^\circ \text{ [sum of } \angle\text{'s in } \Delta\text{]}$ $\therefore \hat{F}_1 + \hat{F}_2 = \hat{C} + \hat{F}_1$ $\therefore \hat{F}_2 = \hat{C}$ <p>but $\hat{C} = \hat{D}$ [}\angle\text{'s in the same segment]}</p> $\therefore \hat{F}_2 = \hat{D}_2$ $E\hat{F}G = F\hat{D}E$	<p>✓ Constr/Kons</p> <p>✓ S</p> <p>✓ R</p> <p>✓ S ✓ R</p> <p style="text-align: right;">(5)</p>
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	<p style="text-align: center;">OR / OF</p> <p><i>Construction: Draw radii OF and OE</i></p> <p>Let $\hat{E}OF = 2x$</p> <p>$\therefore \hat{D} = x$ [\angle at centre = $2 \times \angle$ at circumference]</p> <p>$\hat{O}FE = 90^\circ - x$ [sum of int \angle's of Δ]</p> <p>$\therefore \hat{E}FG = x$ [rad \perp tan]</p> <p>$\therefore \hat{E}FG = \hat{F}DE$</p>	
<p>12.2.1</p>	<p>$\hat{B}AC = 90^\circ$ [\angle in a semi circle]</p> <p>$\hat{E}_2 = 90^\circ$ [line drawn from centre to midpont of chord]</p> <p>$\therefore \hat{B}AC = \hat{E}_2$</p> <p>$BA \parallel OD$ [corresp. \angle's are equal]</p> <p>OR/OF</p> <p>$\hat{B}AC = 90^\circ$ [\angle in a semi circle]</p> <p>$\hat{E}_4 = 90^\circ$ [Line from centre to midpo int of chord]</p> <p>$\hat{B}AC = \hat{E}_4$</p> <p>$\Rightarrow BA \parallel OD$ [Alt \angle's are equal]</p>	<p>✓ S / R</p> <p>✓ S ✓ R</p> <p>✓ R</p> <p>✓ S / R</p> <p>✓ S ✓ R</p> <p>✓ R</p> <p style="text-align: right;">(4)</p>
<p>12.2.2</p>	<p>$\hat{A}_1 = x$</p> <p>$\hat{B} = x$ [tan– chord theorem]</p> <p>$\hat{O}_1 = x$ [corresp \angle's equal, $AB \parallel OD$]</p> <p>$\hat{A}_1 = \hat{O}_1$</p> <p>$\therefore AOCD$ is a cyclic quadrilateral [conv. \angle's in the same segment]</p> <p>OR/OF</p> <p>Let $\hat{O}_1 = a$</p> <p>$\hat{C}_1 = 90^\circ - a$ [int. \angle's of Δ]</p> <p>$\therefore \hat{A}_2 = 90^\circ - a$ [\angle's opp = sides]</p> <p>$\therefore \hat{A}_1 = a$ [tan \perp rad]</p> <p>$\therefore \hat{O}_1 = \hat{A}_1$</p> <p>$\therefore AOCD$ is a cyclic quadrilateral. [Converse \angle's in the same segment]</p>	<p>✓ S ✓ R</p> <p>✓ S ✓ R</p> <p>✓ R</p> <p>✓ S</p> <p>✓ S</p> <p>✓ S ✓ R</p> <p>✓ R</p> <p style="text-align: right;">(5)</p>

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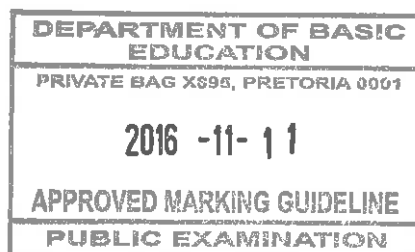
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<p>12.2.3</p>	<p>$\hat{AOC} = 2x$ [\angle at centre = $2 \times \angle$ at circumf.] $\hat{O}_1 = x$ $\therefore \hat{O}_2 = x$ $\hat{C}_2 = \hat{O}_2 = x$ [\angle's in the same segment] $\therefore \hat{C}_2 = \hat{B} = x$ $\therefore DC$ is a tan gent to circle [conv. tan – chord]</p> <p>OR/OF</p> <p>$\hat{OCD} = 90^\circ$ [opp \angle's of cyclic quadrilateral] $\therefore CD$ is a tan gent. [Converse tan \perp rad]</p> <p>OR/OF</p> <p>$\hat{B} = \hat{A}_3$ [\angle's opp = sides] $\hat{A}_3 = \hat{O}_2$ [Alt \angle's; $\hat{O}_2 = \hat{C}_2$ [Angles in the same segment] $\therefore \hat{C}_2 = \hat{B}$ $\therefore DC$ is a tan gent. [Converse tan – chord]</p>	<p>✓ S ✓ R ✓ S / R ✓ R ✓ S ✓ R ✓ S ✓ R ✓ S / R ✓ S / R ✓ S / R ✓ R (4)</p> <p>[18]</p>
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TOTAL/TOTAAL: 150



WZW



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TO: HEADS OF EXAMINATION SECTIONS
HEADS OF CURRICULUM SECTIONS

EXAMINATION INSTRUCTION NO 36 OF 2016

AMENDMENTS TO THE MARKING GUIDELINE OF THE 2016 COMMON EXAMINATION FOR GRADE 11: MATHEMATICS P2

Error on both English and Afrikaans versions: Question 8

1. Due to a typographical error in sub question 8.2, the rate was given as $0,52\text{m}^2/\text{h}$. This is incorrect. The correct rate should have been $0,52\text{m}^3/\text{h}$.
2. As a result this sub question which counts for 4 marks must be excluded.
3. Consequently the total marks for the question paper must be reduced to 146 marks, then scaled up to 150 marks.
4. Refer to **Annexure A** that provides the conversion table that must be used to calculate the learner's total marks.
5. For further information please contact the Director: Examinations and Assessment, Ms P Ogunbanjo at 012 357 3909 or email: Ogunbanjo.p@dbe.gov.za


DR RR POLIAH

CHIEF DIRECTOR: NATIONAL ASSESSMENT AND PUBLIC EXAMINATIONS

DATE: 15-11-16.

